Workshop report
Validation workshop for land use change analysis in Southern region of Mali

Date and venue: 25 et 26 October 2016 (Koutiala) et 27 October 2016 (Bougouni)

Produced by **International Livestock Research Institute**
Published by

November 26th, 2016
www.africa-rising.net

The Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government initiative of Feed the Future.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to eradicate hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve/ enhance the natural resource base.

The three regional projects are led by International Institute of Tropical Agriculture (in West, East and Southern Africa) and International Livestock Research Institute (in Ethiopian Highlands). The International Food Policy Research Institute leads the monitoring, evaluation and impact assessment of the program. http://africa-rising.net/

This document was made possible with support from the American people delivered through the United States Agency for International Development (USAID) as part of the US Government's Feed the Future Initiative. The contents are the responsibility of the producing organization and do not necessarily reflect the opinion of USAID or the U.S. Government.

Contents

List of Tables

List of Figures

Summary

A validation workshop for land use change analysis was held in Sirakelé, Zanzoni and Diéba communities from 25th to 27th October 2016. The objective of the workshop was to validate the maps of land use change for 1984, 1999 and 2009 produced for each community. To be able to talk of the land use in 1984s, 10 participants resident in the village for at least 40 year in each community participated in the workshop. First, the maps of land use developed in 1984s, 1999 and 2009 respectively were presented to participants to discuss the land use changes, and to assess the reasons for the changes. From questions vs responses session, farmers acknowledged the land use changes that have been taking in all communities. They validated some trend in land use change presented on maps and made a correction where maps were not reflecting the realities within their communities. For example participants did not agree with the changes presented on the land uses map of Diéba community. Regarding the drivers of land use changes, population pressure, climate change, intensification of agriculture, deforestation were among the drivers of changes. In nutshell, the workshop met the overall objective and raised the awareness of farmers on their community landscape change. In conclusion, participants argued that such kind of study should incite them to look for alternative options for land use to avoid unfortunate situation in the future.

1. Introduction

West African countries are experiencing changes at different levels—climatic, agricultural, demographic, political and socioeconomic. A number of major challenges threaten the region including high climatic variability; rapidly growing populations and climate-driven land use; as well as human and land cover changes. These challenges are putting more and more pressure on already fragile resource base. For centuries, the impacts of human activities in West Africa region were minor due to low populations, but this has dramatically changed in the last 50 years. Over the past decades, ecosystem has steadily been destroyed. Environmental changes are predicted to accelerate, with unknown and potentially serious implications on both people and environment of West Africa. The drivers of this change are very complex and knowledge of West Africa's resource rich areas remains limited. There is a need to better understand the changes that have been taking place as well wells the biophysical and socio-economic drivers of those changes. With a more understanding of those drivers, it will be possible to predict the future changes and the decision makers may be to propose the mitigation measure of the negative impacts for a given biophysical, socio-economic and political situation.

In this context, International Livestock Research Institute (ILRI) as one of implementation partners of Africa RISING project conducted a study on land use changes in Southern Mali, a region with high pressure on land use. The land use analysis was done to compare the changes in land use patterns between 1984 and 2009 using Landsat data. This analysis provide insight and relevant information on changes in land use patterns that were undertaken under 1984 et 2009 period in each community. This will help to formulate the rules and regulations on different land use types in the local conventions and to ensure sustainable use of the natural resources in the community. For this purpose, this study developed the land uses map for the three years (1984, 1999 and 2009) for Sirakelé, Zanzoni and Diéba communities. In order to validate the results of these maps, the validation workshops were organized by ILRI held on 25th, 26th, 27th October 2016 in these three communities, respectively.

2. Objective of the workshop

The purpose of the workshop was to validate the maps of land use for the three years (1984, 1999 and 2009) produced for each community with the participant of the key informants on the land use changes in each community; to discuss the drivers for such changes and to provide the necessary corrections for the maps produced. The workshop provided an opportunity for the stakeholders to discuss the following:

- Main findings from the data presented in maps on land use change in the communities
- Discuss and validate the findings presented
- Discuss the drivers of the change occurred in the communities

3. Participation in the workshop

About 10 participants in each community participated in the workshop (Annex 1, 2, 3). Participants were people who resident in the village at least 40 years to be able to discuss the land use changes that were undertaken since 1984s. Participated also in the workshop, a research follow from ILRI, a research assistant from ICRISAT and one other person who served as an interpreter.

4. Study areas

The maps were developed for Sirakelé and Zanzoni and Diéba communities respectively, located in Southern region of Mali. The two first communities are located in Koutiala district with high population density (52.32 hab. /km^2), thus the pressure on land is very high. The last community (Diéba) is located in Bougouni district with a low population density (18.37 hab./km^2) compared to Koutiala, but the pressure on resource is very high due to a diversity of the natural resource users from outside of the district. Over the past decades, the land use has changed dramatically due to enormous changes occurred in the agriculture systems in southern Mali.

5. Conduct of the workshop

The workshop was participatory and were conducted in local languages of Bambara for clarity and better understanding of the issues. Workshop activities were divided into two sessions: the presentations of Maps and the discussion session. The workshop was organized in ways that facilitate vibrant discussions (translation, interpretation, structure of. plenary discussions, etc.).

5.1. Opening ceremony

The opening ceremony of the validation workshop was chaired by Mr. Gerard PODA from ICRISAT Mali who started his remarks by welcoming and thanked participants to come and attend this very important workshop despite their daily obligations activities. From there, he the presented the main objectives of the workshop and what was expected from participants.

In concluding, he encouraged the workshop participants to review the content and work together to agree on what changes that have really took place in their communities and ask them to express their opinion freely on the drivers of such change. He then added that the work will be utilized in the interest of their communities.

5.2. Presentation of the findings of the study

The findings of the land use change analysis were presented to participants by Mr. Gerard PODA, GIS research assistant at ICRISAT-Mali who developed the maps of land use for the three years (1984, 1999 and 2009). Information on each land use type in the community was summarized in table for different years (1984, 1999 and 2009).

5.3. Comments and Questions vs Answers emanating from the workshop presentations

This session was organized in term of discussion oriented by Dr. Clarisse UMUTONI from ILRI in collaboration with Mr. Seydou KOITA and Mr. Gerard PODA. The objectives of this session were to:

- Validate the changes in land use over time based on the findings presented by Mr. PODA Gerard on the map
- Identify the key drivers of these changes
- Discuss the implications of these results on agriculture sector and natural resource management

- ❖ Make prediction on land use trend for the community for the next 20 years.

This section was guided by a set of questions which allowed validating findings, to provide corrections where necessary and to document the drivers of changes occurred in land use within study communities. ***Q1: Are the trends in land use change analysis presented on the maps for the period of 1984, 1999, and 2009 reflect the reality for different land use types?***

In all the study areas, participants acknowledged that there has been a change in land use for the period of 1984, 1999, and 2009 in their communities as a result of human activities. However, in Diéba community, participants did not agree with the majority of reported figure in land use changes. In contrast, the trends reported, in Zanzoni and Sirakelé communities, were validated by participants, except for shrub savanna and bare ground trends in Sirakelé and water bodies in Zanzoni. Below Table 1, 2, 3 and Figure 1, 2 and 3 are the corrected trends in land use change according to the key informants 'views.

Table 1. Trend in land use changes in Sirakelé community

Variable /SIRAKELE	1984	1999	2009
Cropped area	47%	64%	55%
water bodies	0%	0%	3%
Riparian forest	1%	1%	1%
Woody savanna	29%	2%	6%
Shrub savanna	20%	15%	10%
Dry forest	0%	0%	2%
Bare ground	30%	20%	10-15%

Table 2. Trend in land use changes in Zanzoni community

Variable/ZANZONI	1984	1999	2009
Cropped area	44%	76%	57%
water bodies	0%	1%	5%
Riparian forest	1%	2%	12%
Woody savanna	9%	4%	6%
Shrub savanna	45%	12%	23%
Dry forest	3%	1%	2%
Bare ground	-	0%	2%
Flooded area	2%	-	-

Table 3. Trend in land use changes in Diéba community

Variable /DIEBA	1984	1999	2009
Cropped area	37%	50%	70%
Water bodies	8%	4%	2%
Riparian forest	10%	8%	5%
Woody savanna	25%	15%	5%
Shrub savanna	30%	10%	22%
Bare ground	0%	3%	2%
Flooded area	4%	4%	4%
Regrowth vegetation/Fallow	4%	2%	1%

Q2: What are the drivers of the observed trends in land use changes in the community?

1) <u>Cropped area</u>:

The finding showed that the percentage of land under agricultural was increased between 1984 and 1999 in all study areas. This increase is attributed to:

- Population growth
- Family division
- Decrease in land fertility
- Low productivity
- Lack of cooperation

Firstly, farmers stated that in the 1984s, population was low and the big family worked together and cultivated the same land. By the 1984-1999s, there was an increase in crop agricultural land due to population growth. Collective crop agricultural lands were no longer enough to feed the big family. This has resulted in land division owned by the big family to individual plot so that the head of the small household could take in charge the need for their own small family members. This has also contributed to the increase of the area under crop agricultural land. According to participants the purpose of land division was to share responsibility among family members. In short, population growth drivers the change of the crop land to feed their growing family. According to the key informants, the population growth continues and will continue to

be a major driver of the expansion of cultivated area. From 1984s up today, population has almost doubled as shown in Table IV. This population growth is putting more and more pressure to arable land.

Table 4. Participant's perception on population growth between 1994 and 2016

Community	1984	2016
Sirakelé	3000	5500
Zanzoni	1500	3000
Diéba	800	1500

Moreover, the misunderstanding among family members has also led to family division which also led to the family land division into small plot for divided family member's independence. This has also resulted in clearing new crop land for the family divided. Democracy is one of the factor that has contributed to this misunderstanding among families and community members as stated by the key Informants. Therefore, the increase of family division.

Secondly, the decrease of land fertility has contributed to the increasing the area under crop agriculture, this incited farmers to extend the cropped land to be able to satisfy the need of their family.

The drought was also listed as driver of expansion of agriculture area. The most immediate result of drought was a fall in crop production, due to the inadequacy and poorly distributed rainfall. Farmers experienced the harvests that was not enough to either feed their families or meet their other commitments. Thus, the increase in cropped area in order to satisfy their need.

In Diéba community, some other reasons have been listed as the cause of increased crop land observed since 1999s. Among others, these reasons were:

(1) Attribution of fields to women

(2) Settling of migrants

(3) Development of fallow land which resulted in expansion of agricultural fields

Around 2009, there was a decrease in area under crop agriculture in Zanzoni and Sirakelé communities while in Diéba community, cropped area continued to increase.

Farmers in Zanzoni community stated that around 2009s, crop lands area were big but the inputs were no sufficient. Therefore, farmers reduced area under crop agricultural land to be able to have enough input such as fertilize to cover cultivated land. Further, erosion has also contributed to the decrease of cropped land by the 2009s, due to abandonment of some cropped land.

In Sirakelé community, the migration of the population to urban areas resulted in the decrease of cropped area by the 2009s. Due to the food insecurity, livelihood in the community was getting harder and harder and the challenges were increasing day to day. Therefore, some people started to migrate to urban area or to other area in searching of job or other source of income, thus, some created crop land by the 1999s were abandoned.

2) <u>Water bodies (river, stream, ponds, etc.)</u>:

The maps show an increase in the % of water bodies from 1984 to 2009 in Sirakelé and Zanzoni community. Informants reported that in 1984 there were no visible water bodies due to vegetation which were covering the high percentage of the land and where some water bodies existed, they were also covered by the vegetation and forest. However, in 1999s, due to the deforestation and decrease of land vegetation cover, there was an increase in water bodies. Land vegetation cover decrease and deforestation have resulted in either development or creation of space for water retention.

In contrast to Sirakelé and Zanzoni communities, a decrease in water bodies has occurred in Diéba community between 1984 and 2009. Informants related this to:

- To an increase of livestock, especially transhumant herds that degraded land and caused stream which resulted in blocked up water bodies.
- Encroachment of water bodies into agriculture land
- Drought (decrease in rainfall)

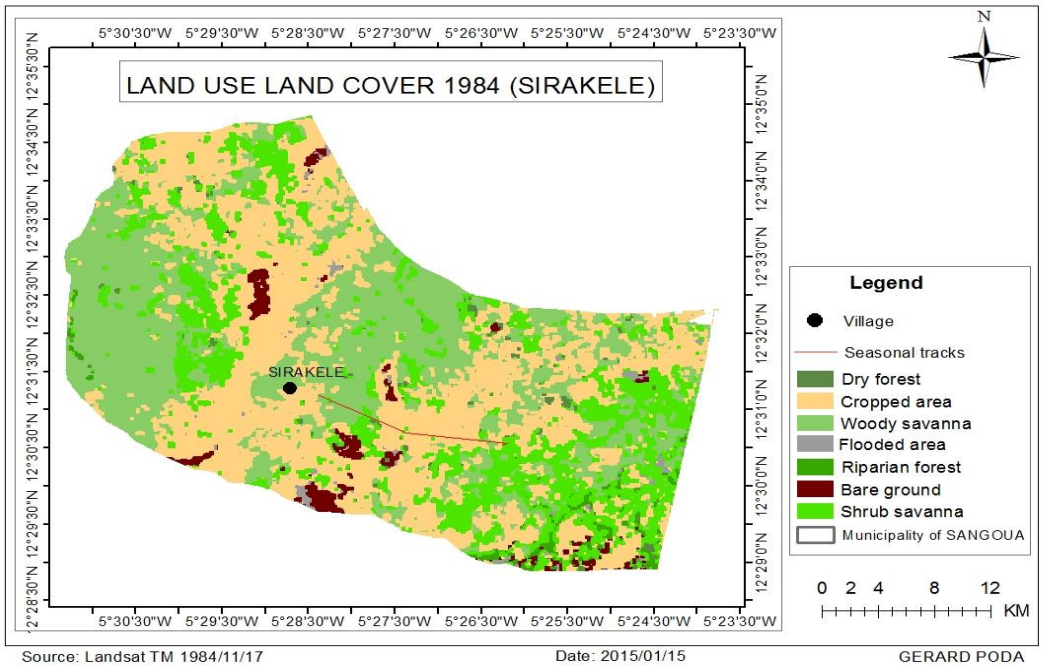

Figure 1 (a) Land use in Sirakelé-1984

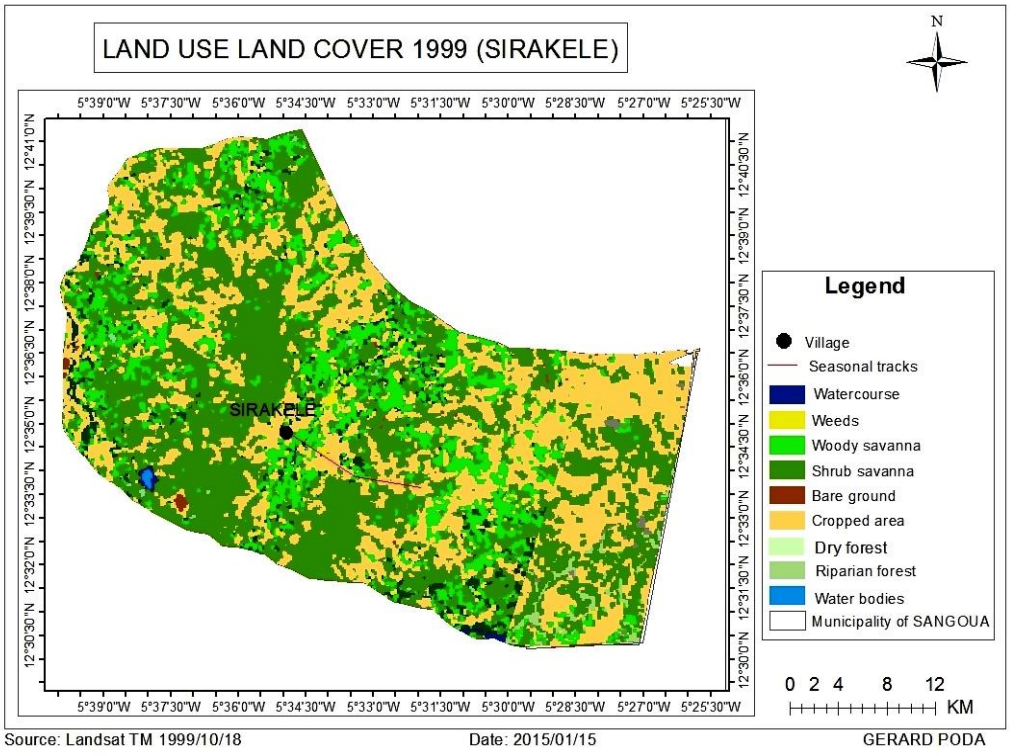

Figure 1 (b) Land use in Sirakelé-1999

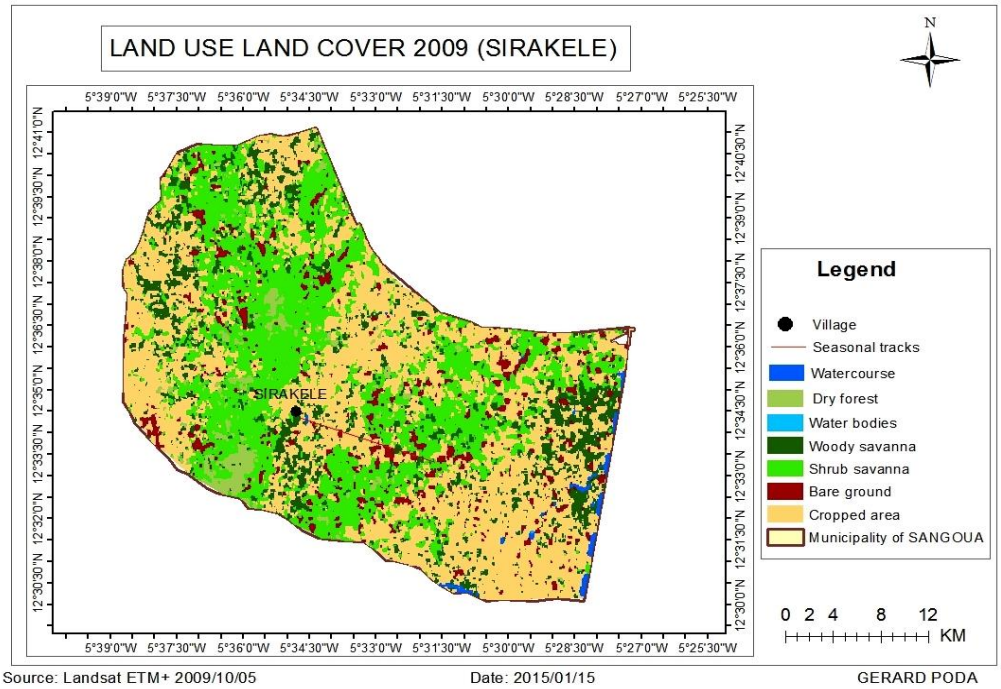

Figure 1 (c) Land use in Sirakelé-2009

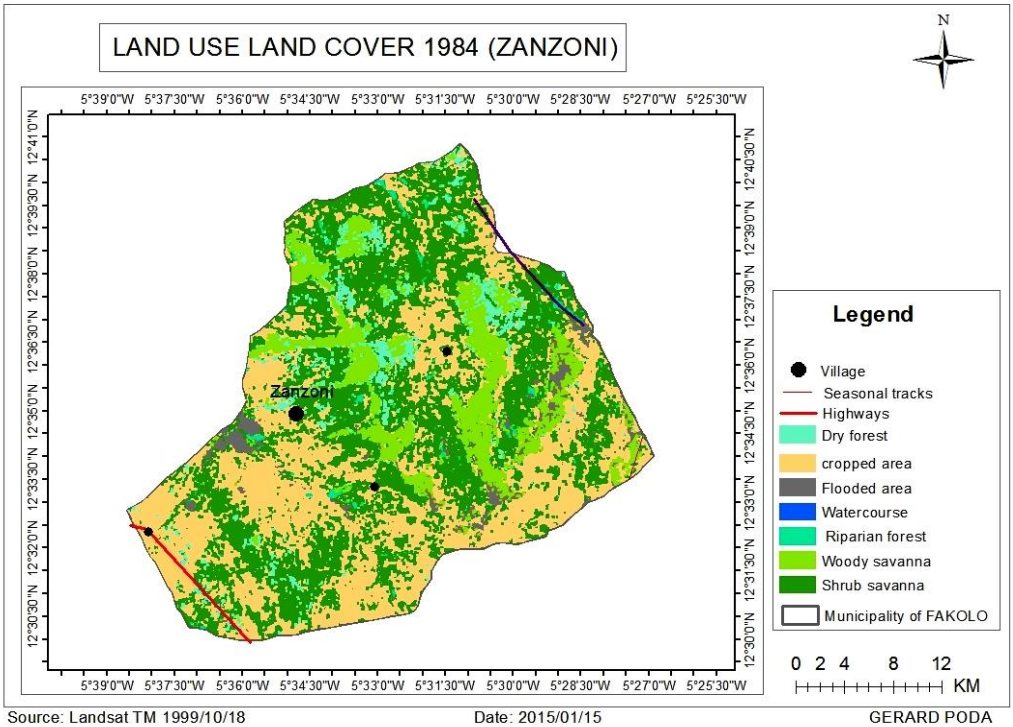

Figure 2 (a). Land use in Zanzoni -1984

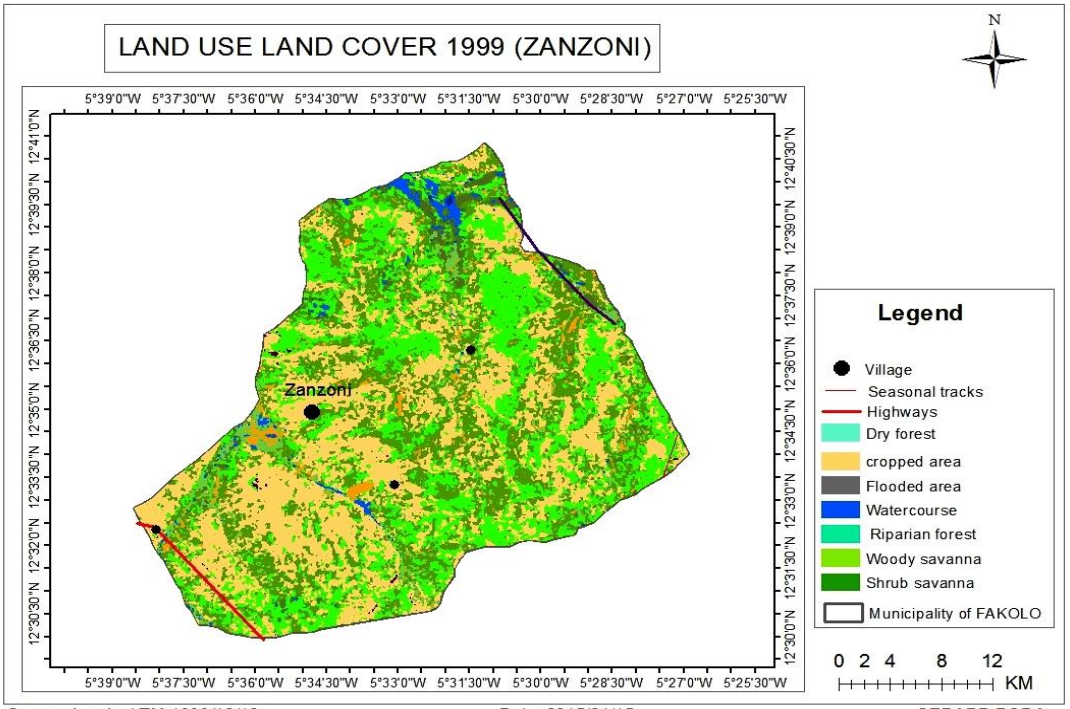

Figure 2 (b). Land use in Zanzoni -1999

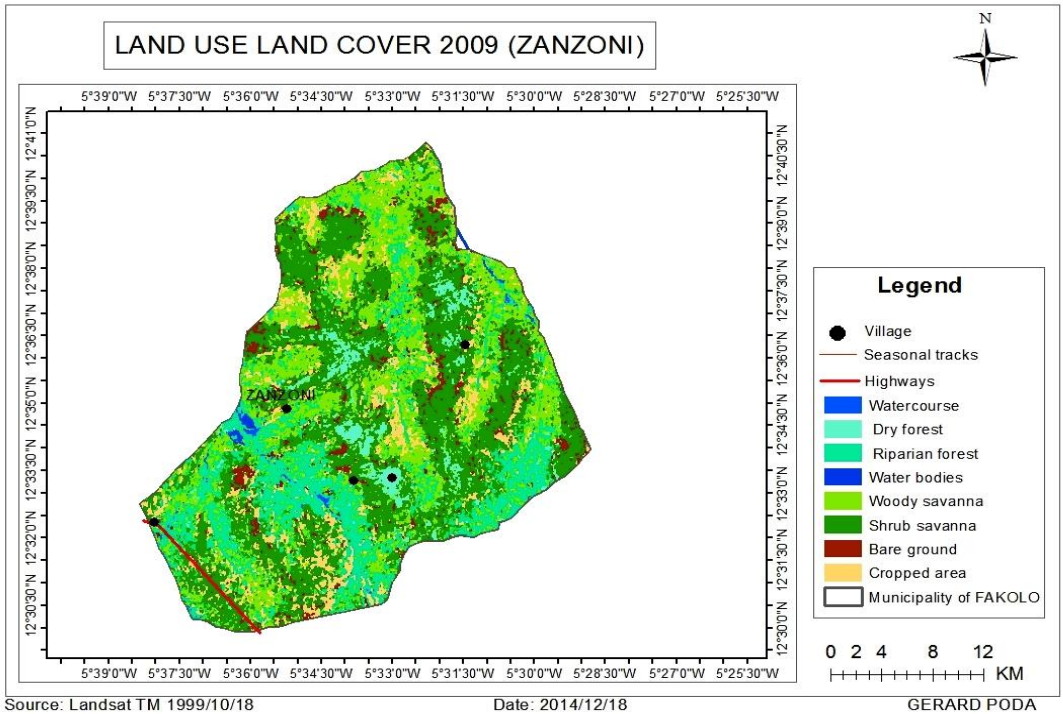

Figure 2 (c). Land use in Zanzoni -2009

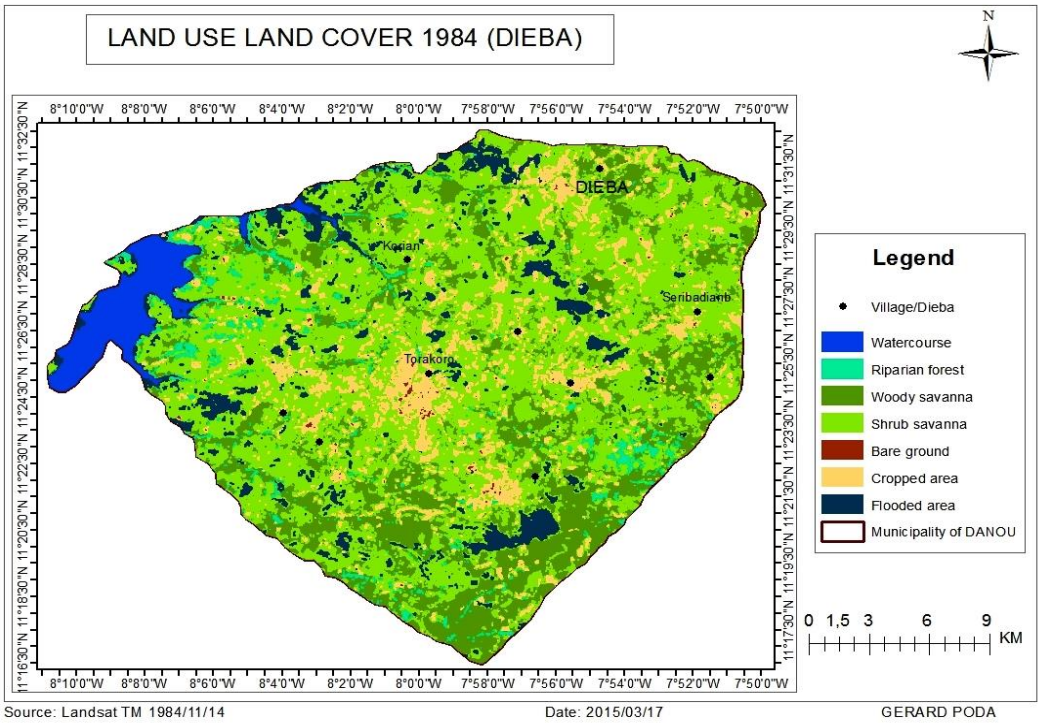

Figure 3 (a) Land use in Diéba-1984

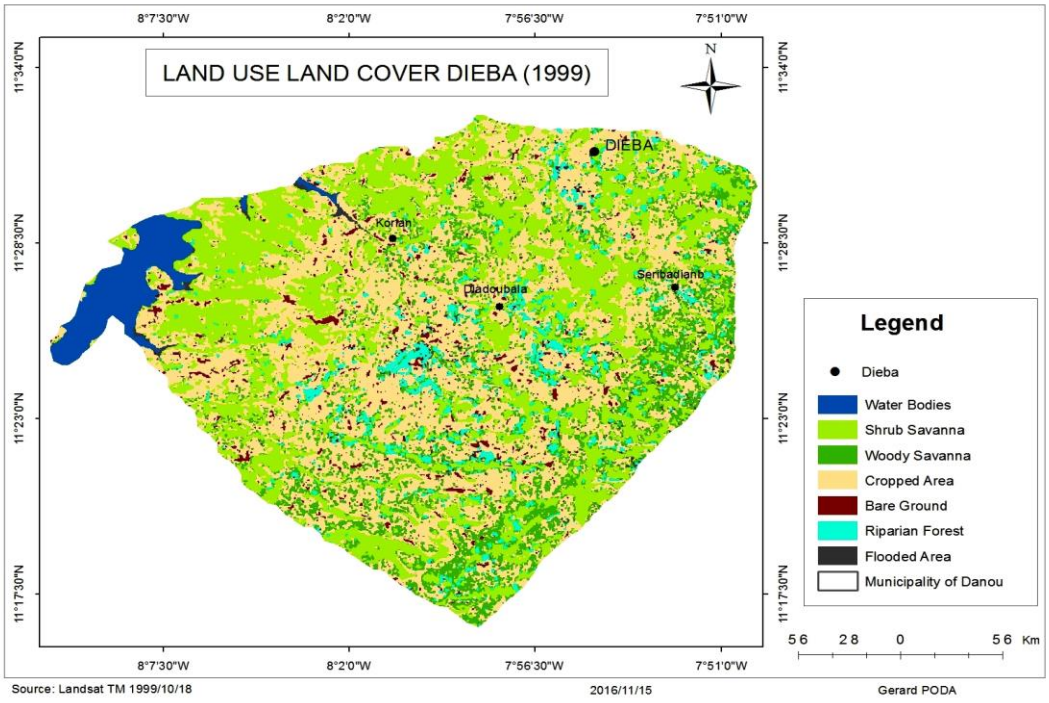

Figure 3 (b) Land use in Diéba-1999

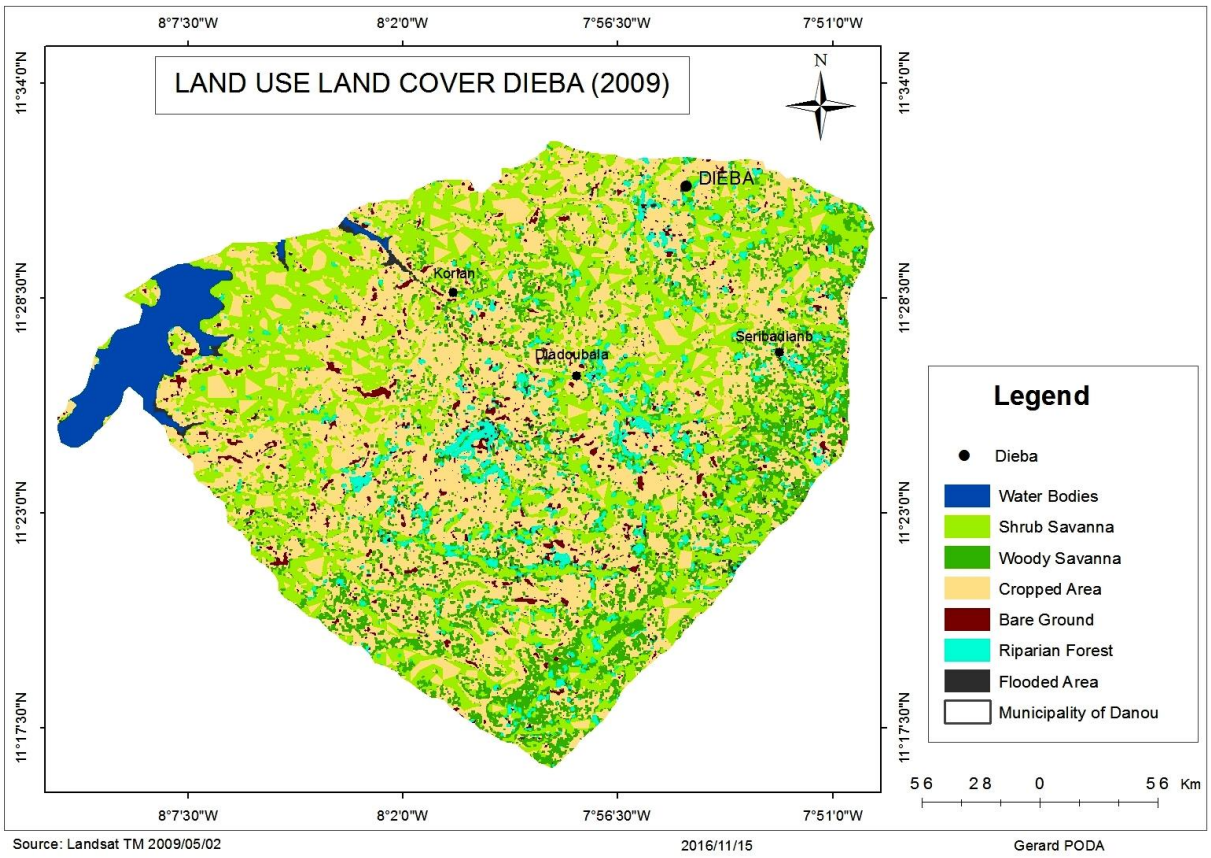

Figure 3 (c) Land use in Diéba-2009

3) Riparian forest

a) In Sirakelé community:

According to the key informants, there was no river or stream to allow the presence of riparian forest all over the community.

b) In Zanzoni community: An increase in riparian forest was reported in the year 1999 and 2009. This increase was attributed to the development of river, stream, pond which allowed the development of woodland at riverbanks or along streams. The increase of riparian forest was also the results of plantation of tree around water pond and the high regeneration of Eucalyptus due to their fast growing (invasion of Eucalyptus). According to farmers, the invasion of Eucalyptus was associated with change in native plant species composition. In addition, tree cutting which favored the creation of water bodies has also allowed the development of riparian forest along these water retentions.

c) In Diéba community: A decrease in Riparian forest has been reported. Farmers reported that change in land use has led to the land destruction and fragmentation. The others causes of decrease in Riparian forest were:

- Abusive overuse: the interest of riparian forest lies in their resources that are utilized by neighboring communities to satisfy their basic need and as source of income. As results, plant species are decreasing.
- Development of new crop land
- Drought (climate change)

4) Woody Savanna :

a) In Zanzoni and Sirakelé communities:

- A huge decrease in woody Savanna was reported between 1984 and 1999. This was due to the population growth and decrease in soil fertility which increased the incentive of farmers to expand the agricultural land by cutting trees. Others cause which contributed in decreasing woody Savanna were a strong winds and drought.

- Increase in woody Savanna occurred in the 2009s, due to the plantation of these trees and development of Norms regulating their use. There was a prohibition of tree cutting without authorization. According to the key informants, since 1999-2009, the government sensitized farmers about the effects of cutting trees, and farmers started to be aware of the effect of their activities on their surrounding environment, thus the reduction in tree cutting. Instead common programs such as planting new trees were organized, and the population also started to plant trees on their own. The main trees planted were Caecedra trees. From time to time, the government introduced new law and regulation concerning the trees cutting in its goal of environment protection.

b) In Diéba community:

A decrease in woody Savanna was reported from 1984 to 2009 due to abusive cut of trees and damage of trees due to high wind. Participants stated that strong winds exceed the strength that has developed in tree stems and root systems, and trees either uprooted or their stems broke.

5) Shrub savanna :

a) In Sirakelé community:

Shrub savanna were high prior to 1984. Farmers reported that they even sometime organized controlled bush fire to reduce these shrub savanna. However, from 1984 to 2009, shrub Savanna decreased dramatically due to climate change, increase in human activity, and expansion of agricultural field.

b) In Zanzoni and Diéba communities:

A decrease in Shrub savanna was reported between 1984 and 1999, and a low increase between 1999 and 2009.

The decrease reported from 1984 to 1999 was due to:

- Abusive tree cutting by women. Women need fire wood which in the same time sources of incomes earning for women
- Population growth which increased the demand for firewood
- Drought

- High intensity grazing has also impacted the Shrub savanna

A small increase was observed between 1999 and 2009 due to plantation of new trees and some crop fields were left in fallow and this allow shrub to regrow. New norms regulating trees cutting have also played a big role in trees regeneration.

6) Dry forest

From 1984 to 1999, there was a reduction of dry forest in Zanzoni community caused by drought, abusive cut of tree. The deforestation was driven the need of the population to expand their field since the major zone of crop agriculture were in the dry forest. Population growth has also contributed in reduction of dry forest as they were used to meet human development needs and livelihoods demands. For example, participants stated that timber, wood fuel and charcoal were used locally to meet the basic needs and to generate income. This increased the pressure on the dry forest. Informants related this to the population growth that led to the increase of the demand of wood fuels as well charcoal. Therefore, the sale of wood fuel became a business in rural area. Furthermore, the high level of poverty encourages overexploitation and conversion of dry forest to other seemingly more profitable land uses.

However, from the year 1999 to 2009. There was a little increase in dry forest as a result of:

- Formulation and development of norms regulating tree cutting
- Communal tree planting program effort

In addition to this, trees started to regenerate from field abandoned without being cultivated.

7) Bare ground

The bare grounds were almost inexistence by the 1984s in all study community. The vegetation grew everywhere. However, from the 1984s, the bare grounds increased due to the following as stated by the key informants:

- Climate change (drought)
- Land overexploitation

The maps shows a decrease in bare ground in 2009s in Diéba community, and participants explained that the observed decrease was due to some farmers who tried to cultivate these area to trying the productivity from these land. However, later they abandoned as there was no much income coming from these land compared to the investments made.

8) Weeds

All communities involved in this study experienced an increase in weeds from 1984 to 2009. The increase in weeds was associated to:

- over-exploitation of lands, which resulted in decreasing in soil fertility and create an environment for weeds growth
- use of organic fertilizer
- increasing of transhumant herds in the communities

9) Flooded area

A decrease in flooded area was reported between 1984 and 2009 in Zanzoni community. In fact, participants stated that loss of natural vegetation and farming practices have led to the loss of soil due to erosion of the land into the flooded area and later, the flooded area were filled up by soils washed and then have been blocked up.

In Diéba community, due to restoration program brought by project and the increasing of interest of women in exploiting these areas, an increase of the flooded area was reported in the 2009s.

10) Fallow

A decrease in the area under fallow was noticed in almost all study community. For example in Diéba community, a decrease to ¼ was registered from 1984 to 2009. The percentage of the area under fallow was recorded to be 4 per cent, which decrease up to 1% in the year 2009. The decrease in fallow land was attributed to land pressure caused by steady growth of population, internal migration, and the impacts of recent land policies. In addition to this, people were hesitating to leave their land in fallow since when someone noticed that a land is under fellow

for more than 1 year had the right to come and cultivate it (a land under fallow for more than one year could be exploited by someone else want it). Informant stated that until the 1984s, people could leave their land under fallow for a long period (10 years to 20 years) because uncultivated land was still generally available. However since the 1984s, people started to reduce the period for fallowing to 2 years. (Short period of fallow around 1 to 2 years).

To date lands under fallow represent 10%, 1% and 0% respectively in Sirakelé, Zanzoni and Diéba communities. The lack of land under fallow in Diéba compared to other community is not due to high pressure as it should seem but this is attributed to land ownership and land security. In fact, community land norms suggest that any land under fallow should be cultivated by anyone. This is commonly called the concept of*'mise en valeur'* (this means that: if land is not under ''productive use,'' it can be allocated to someone who will do so). As a result, villagers are continually cultivating their land even though they may not expect any harvesting. This is a way to secure the land ownership.

Q3: What are the implications of the land use change in the village on natural resources, crop and livestock production?

Land use change is necessary and essential for economic development and social progress. However, land use change does not come without costs. Farmers related that land use change and land management practices had major impact on natural resources including water, soil, plants, and animals. They also stated that deforestation, expansion of agriculture, and other human activities have substantially altered the community landscape. Such disturbance of the land affects important farm 'productivity.

Land use change has allowed adoption of intensive agriculture with associated consequence on natural resource management. Farmers stated that between 1984 and 1999, they had adopted new technologies and new farming practices (such use the use of fertilizer, farming machine, etc.) which allowed them to increase the productivity from their land but in long term these new practices have the negative effects on NRM. Intensive farming and deforestation caused by land use change have been identified as a leading factors to soil erosion, desertification and

other soils degradation. These effects have reduced the quality and agriculture productivity in long run.

Land use changes have resulted in reduction of grazing area for livestock. Besides, although, intensive farming has contributed to the increase of number of livestock, livestock productivity has reduced due to insufficient of grazing area caused by land use changes (expansion of crop area into grazing area). According to farmers, deforestation destroys habitats that support biodiversity and increases soil erosion, flooding and landslides. Informants reported a decline in biodiversity and species extinction due to land use changes. For example some plant species have despaired or decreased, while others species have invaded the landscape.

Land use change has been also identified as the main cause of increasing competition between livestock and crop systems with associated conflict. There has been an increase in conflict over resources (the independence of same family members has created problem around resources allocation, access, especially land), especially conflict between farmers –herders.

Land use change had also implication on policy change. Resources regulation is a contentious issue in a changing environment. In fact, land use change and its drivers have created divergence among resources users leading to inefficient in resources allocation and use in all studied communities. Land use changes have increased the incentive of community in land use planning. As explained by informants, traditional systems were no longer efficient for regulating resource use and allocation. Due to the change occurred in the system, traditional command and control approach led to inefficient in land use patterns and allocation. Such institutions failure has provided justification for development (reform) of new norms regulating resources uses and allocation in the communities. Incentive–based policies are increasingly used in Diéba, Zanzoni and Sirakelé to influence NR use decisions.

Q4. How will be look like the land use for the community in next 20 years?

a) <u>In Sirakelé community:</u>

Participants in the workshop stated that if no measure is taken to reduce the impact of land use changes on environment and food security, the situation will be worsen in 20 coming years.

Informants' perceptions clearly revealed that 30 % of the total land within the community will be allocated to human habitation, while 65 % to crop field. Only 5% of the land will be allocated to trees, especially sacred forests. Informants stated that there will be no trees, no vegetation, and no waterbodies. No grazing will be available for animal keepers. The latter, will search for their own solution. Animal keepers will probably leave a small plot of their land for their animals. By that time, the only solution to overcome these challenges will be to return to the old traditional system of common land use. This will at least contribute in reducing the area allocated to crop agriculture land and create space for tree replantation.

Example of evolution of grazing land in Sirakelé community

- In 1984, grazing area occupied 80 % of the village land
- 1999, 60 % of the village land
- 2009, 30 % of the village land
- In 20 years after 2009 (2029), only 5% of the village land will be available for animal grazing.

The figure below illustrates how the grazing land reduced up to almost 1/3 from 1984 to 2009.

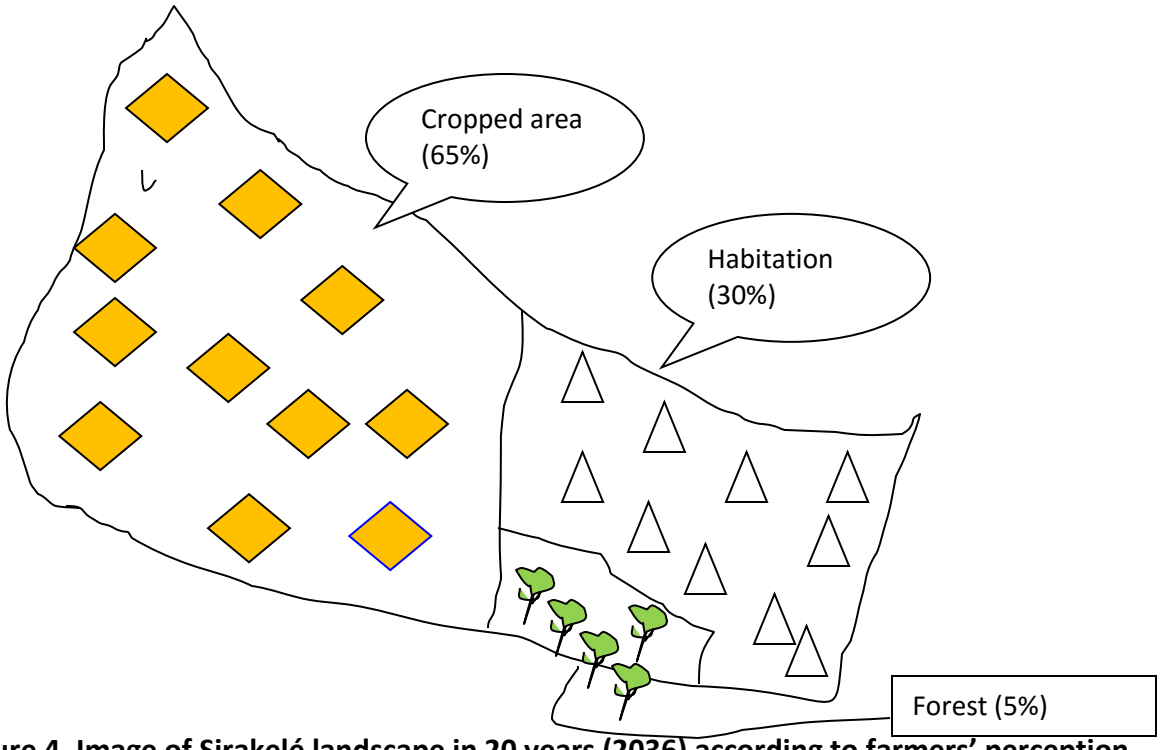

Figure 4. Image of Sirakelé landscape in 20 years (2036) according to farmers' perception

b) In Zanzoni community:

According to informants, in the next 20 years, there will be a decrease in crop land, an increase in land under habitation due to population growth, an increase in bare ground with few shrub and woods.

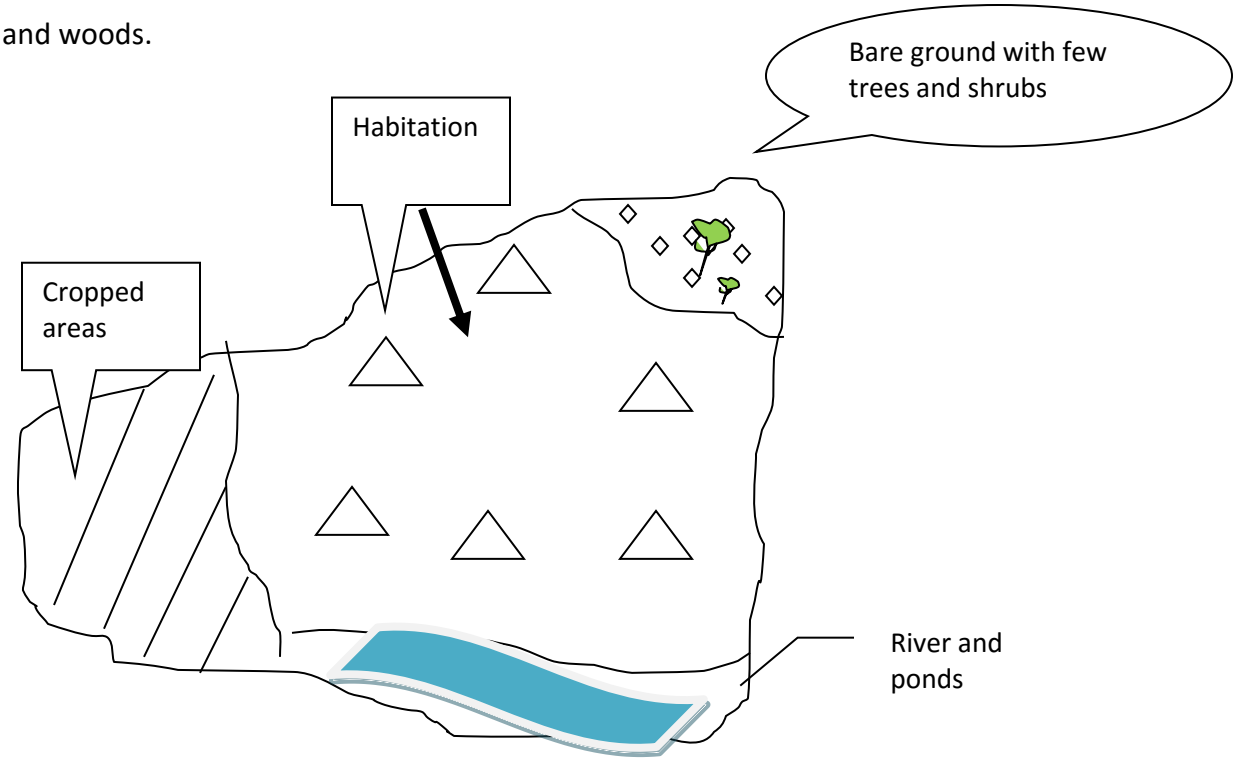

Figure 5. Picture of Zanzoni landscape in 20 years (2036) according to farmers' perception

c) In Diéba community:

In Diéba community, key informants predict that there will be an increase in livestock numbers in the nest 20 years while grazing area will decrease dramatically. In 20 coming years, they will be more population and high pressure on land.

- Habitation: 40 %
- Crop Field: 30 %
- Grazing area: 10 %
- Water bodies: 5%
- Forest: 15%.

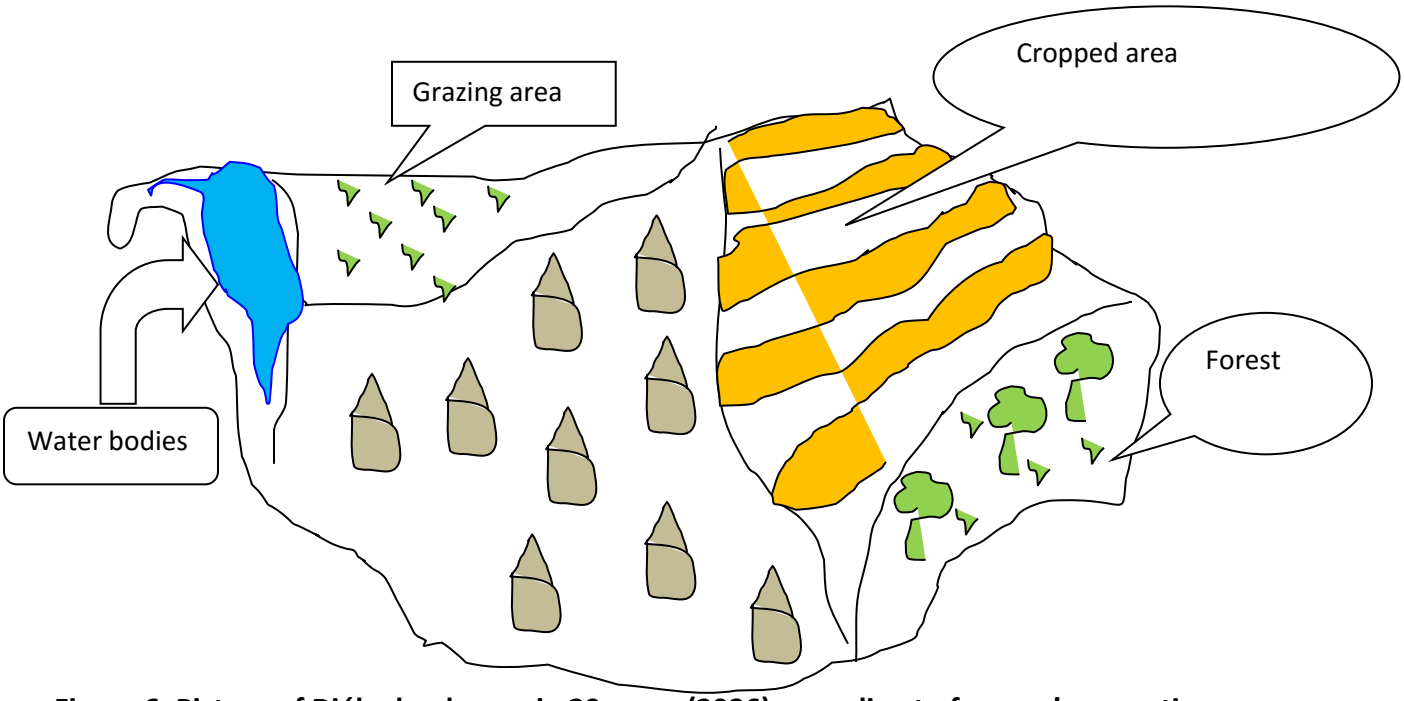

Figure 6. Picture of Diéba landscape in 20 years (2036) according to farmers' perception

5.4. Feedback from participants in workshop

Participants stated that the workshop has raised their awareness as regard to what is going on in their community landscape and the change that have been occurred. From the discussion, they realized how the situation is getting worse and alarming. In addition, participants added that this kind of study should incite them to look for alternative options for land use to avoid unfortunate situation. Besides, in all communities, participants were surprised with the effect that has had the rules developed on tree regeneration.

From participants' discussion, urgent action must be taken to reduce the impact of land use changes. When informants were asked what should be done to avoid worse situations, same participants stated, «Only *God is in charge, he will intervene by regulating the climate change*». However, others participants listed some concrete actions that must be taken from their own side:

(1) Change in community members behavior

(2) Tree plantation program

(3) Restoration program

(4) Enforcement of land use policy

5.5. Closing remarks

On behalf of visiting team, Mr. Koita Seydou in Sirakelé and Zanzoni communities and Mr. Poda Gerard in Diéba community thanked all the participants for their presence and active involvement throughout the workshop proceedings. Dr. Clarisse re-iterated the importance of farmers' practices in land use changes and call participants to act to reduce strong impact. She also stated that the work done will help in predicting changes that are likely to occur in future and should be used to propose effective management options that may orient community in their decision over land use.

6. Conclusion

The validation workshop started and ended well. Participants in workshop in all villages were happy with the fruitfully exchange and kind of discussions engaged. They confirmed that the workshop provide a strong framework for discussing on what is happening in their community landscape and this should guide them in taking new actions to sustain the use of land in their communities. On the other side, the workshop met the overall objective, the land use changes that occurred for the year 1984, 1999, and 2009, the main drivers of these changes, their implication on natural resource management as well as to crop and livestock productivity have been well documented in all study area. The discussion concluded that the worse will happen in the next 20 years to come years if no measure is taken to avoid unfortunate situation.

ANNEXE

Annex 1. List of participants in workshop in Sirakelé community

N°	Name	Sex
1	Adama TRAORE	M
2	Yaya TRAORE	M
3	Tahirou COULIBALY	M
4	Abdoulaye COULIBALY	M
5	Mamatou TRAORE	M
6	Sinaly TRAORE	M
7	Siguéna TRAORE	M
8	Mahawa COULIBALY	F
9	Minata COULIBALY	F
10	Ramatou COULIBALY	F

Annex 2. List of participants in workshop in Zanzoni community

N	Name	Sex
1	Drissa DIALLO	M
2	Amadou DEMBELE	M
3	Zoumana DEMBELE	M
4	Souleymane COULIBALY	M
5	Salif KEITA	M
6	Bakary DEMBELE	M
7	Mamatou SANOGO	M
8	Sekou DEMBELE	M
9	Balla BALLO	M
10	Fanta COULIBALY	F
11	Assetou SANOGO	F
12	Mariam COULIBALY	F

Annex3. List of participants in workshop in Diéba community

N	Name	Sex
1	Nigalé DOUMBIA	M
2	Madio DOUMBIA	M
3	Rockia DOUMBIA	F
4	Masseni BAGAYOKO	F
5	Tièscouba BAGAYOKO	F
6	Mery SAMAKE	F
7	Souroukou BAGAYOKO	M
8	Bakary BAGAYOKO	M
9	Koniba BAGAYOKO	M
10	Basseriba SAMAKE	M